

U.S. Patent Application No. 10/085,659
Reply to Office Action dated November 25, 2005

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IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application. An identifier indicating the status of each claim is provided.

Listing of Claims

1. (Currently Amended) An optical state modulation method comprising:
periodically modulating luminance of an original display image in temporal domain ~~so as~~ to generate an optical state variation on a recorded image that is obtained by image-capturing of the modulated display image,
said optical state variation being independent of said original display image and without generating ~~no~~ a hampering effect when said displayed image is directly watched,
utilizing a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, in said luminance modulation.
2. (Original) The optical state modulation method according to claim 1, wherein,
when said luminance modulation is performed based on a sinusoidal waveform, an amplitude and frequency of said sinusoidal waveform are determined to satisfy a first condition,
said first condition being that an amplitude and frequency of said optical state variation in each frame of said recorded image obtained by an image-capturing apparatus correspond to the value equal or more than a temporal frequency contrast sensitivity of human

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vision determined at the luminance of said original display image.

3. (Original) The optical state modulation method according to claim 2,
wherein,

in addition to said first condition, the amplitude of said sinusoidal waveform is
determined to satisfy a second condition,

said second condition being that the amplitude of said luminance modulation is
equal or less than an amplitude that is obtained from said temporal frequency contrast sensitivity
of human vision by setting a frequency component thereof to the frequency of said sinusoidal
waveform determined in claim 2 for the luminance of said original display image.

4. (Original) The optical state modulation method according to claim 1,
wherein,

when said luminance modulation is performed based on a composite waveform,
an amplitude and frequency of at least one of sinusoidal wave components composing said
composite waveform are determined to satisfy a first condition,

said first condition being that an amplitude and frequency of said optical state
variation in each frame of said recorded image obtained by an image-capturing apparatus
correspond to the value equal or more than a temporal frequency contrast sensitivity of human
vision determined at the luminance of said original display image.

5. (Original) The optical state modulation method according to claim 4,
wherein,

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in addition to said first condition, the amplitude of said at least one of sinusoidal wave components is determined to satisfy a second condition,

said second condition being that the amplitude of said luminance modulation is equal or less than an amplitude that is obtained from said temporal frequency contrast sensitivity of human vision by setting a frequency component thereof to the frequency of said at least one of sinusoidal wave components determined in claim 4 at the luminance of said original display image.

6. (Original) The optical state modulation method according to claim 1,
wherein

said luminance modulation is performed by applying different types of luminance modulation on corresponding spatial positions of said original display image.

7. (Original) The optical state modulation method according to claim 1,
wherein

said luminance modulation is performed by applying different types of luminance modulation on corresponding time periods.

8. (Original) The optical state modulation method according to claim 1,
wherein

said luminance modulation is performed so as to hold a same display luminance in each frame before and after said luminance modulation, said display luminance being a

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luminance perceived by a audience.

9. (Original) The optical state modulation method according to claim 1,
wherein
said optical state variation appeared on said recorded image is a variation in color
domain.

10. (Currently Amended) An optical state modulation application system
comprising:
a projection type display apparatus projecting a display image onto a screen[[,]];
and
an optical state modulation apparatus acting on a projection light in an projection
light path to apply a periodic luminance modulation in temporal domain on an original display
image, wherein
the luminance of said original display image is modulated to generate an optical
state variation on a recorded image obtained through image-capturing of the modulated display
image,
said optical state variation being independent of said original display image and
generating no hampering effect when said modulated display image displayed on said screen is
directly watched, and
a rotation filter, including a rotate-able filter part having a sinusoidal density
variation along its circumferential direction, used in said luminance modulation.

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11. (Currently Amended) An optical state modulation application system comprising:

a projection type display apparatus projecting a display image onto a screen[[.]]:

and

an optical state modulation apparatus controlling a light source of said display apparatus to apply a periodic luminance modulation in temporal domain to an original display image, wherein

the luminance of said original display image is modulated to generate an optical state variation on a recorded image obtained through image-capturing of the modulated display image,

said optical state variation being independent of said original display image and generating no hampering effect when said modulated display image displayed on said screen is directly watched, and

a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

12. (Currently Amended) An optical state modulation application system comprising:

a projection type display apparatus projecting a display image onto a screen[[.]]:

and

an optical state modulation apparatus controlling an image signal of said display apparatus to apply a periodic luminance modulation in temporal domain on an original display image, wherein

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the luminance of said original display image is modulated to generate an optical state variation on a recorded image obtained through image-capturing of the modulated display image,

said optical state variation being independent of said original display image and generating no hampering effect when said modulated display image displayed on said screen is directly watched, and

a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

13. (Currently Amended) An optical state modulation application system comprising:

a direct view type display apparatus displaying a display image onto a display screen[,]; and

an optical state modulation apparatus generating an effect on a display light to apply a periodic luminance modulation in temporal domain on an original display image, wherein

the luminance of said original display image is modulated to generate an optical state variation on a recorded image obtained through image-capturing of the modulated display image,

said optical state variation being independent of said original display image and generating no hampering effect when said modulated display image displayed on said display screen is directly watched, and

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a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

14. (Currently Amended) An optical state modulation application system comprising:

a direct view type display apparatus displaying a display image onto a display screen[[,]]; and

an optical state modulation apparatus controlling a light source of said display apparatus to apply a periodic luminance modulation in temporal domain on an original display image, wherein

the luminance of said original display image is modulated to generate an optical state variation on a recorded image obtained through image-capturing of the modulated display image,

said optical state variation being independent of said original display image and generating no hampering effect when said modulated display image displayed on said display screen is directly watched, and

a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

15. (Currently Amended) An optical state modulation application system comprising:

a direct view type display apparatus displaying a display image onto a display screen[[,]]; and

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an optical state modulation apparatus controlling an image signal of said display apparatus to apply a periodic luminance modulation in temporal domain on an original display image, wherein

the luminance of said original display image is modulated to generate an optical state variation on a recorded image obtained through image-capturing of the modulated display image,

said optical state variation being independent of said original display image and generating no hampering effect when said modulated display image displayed on said display screen is directly watched, and

a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

16. (Currently Amended) An optical state modulation apparatus of a luminance modulation application system, wherein:

a periodic luminance modulation in temporal domain is applied to a projection light projected from a projection type display apparatus to generate an optical state variation on a recorded image that is obtained by image-capturing of a displayed image,

said displayed image being an image displayed on a screen to which the modulated projection light is projected,

said optical state variation being independent of an original display image and generating no hampering effect when said displayed image is directly watched, and

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a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

17. (Currently Amended) An optical state modulation apparatus of a luminance modulation application system, wherein:

a periodic luminance modulation in temporal domain is applied to a light source of a projection type display apparatus to generate an optical state variation on a recorded image that is obtained by image-capturing of a displayed image,

said displayed image being an image displayed on a screen to which a projection light from the modulated light source is projected,

said optical state variation being independent of an original display image and generating no hampering effect when said displayed image is directly watched, and

a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

18. (Currently Amended) An optical state modulation apparatus of a luminance modulation application system, wherein:

a periodic luminance modulation in temporal domain is applied to an image signal of a projection type display apparatus to generate an optical state variation on a recorded image that is obtained by image-capturing of a displayed image,

said displayed image being an image displayed on a screen to which a projection light according to the modulated image signal is projected,

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said optical state variation being independent of an original display image and generating no hampering effect when said displayed image is directly watched, and a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

19. (Currently Amended) An optical state modulation apparatus of a luminance modulation application system, wherein:

a periodic luminance modulation in temporal domain is applied to a display light of a direct view type display apparatus to generate an optical state variation on a recorded image that is obtained by image-capturing of a displayed image,

said displayed image being an image of the modulated display light of said direct view type display apparatus,

said optical state variation being independent of an original display image and generating no hampering effect when said displayed image is directly watched, and a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

20. (Currently Amended) An optical state modulation apparatus of a luminance modulation application system, wherein:

a periodic luminance modulation in temporal domain is applied to a light source of a direct view type display apparatus to generate an optical state variation on a recorded image that is obtained by image-capturing of a displayed image,

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said displayed image being an image from the modulated light source of said direct view type display apparatus,

said optical state variation being independent of an original display image and generating no hampering effect when said displayed image is directly watched, and

a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

21. (Currently Amended) An optical state modulation apparatus of a luminance modulation application system, wherein:

a periodic luminance modulation in temporal domain is applied to an image signal of a direct view type display apparatus to generate an optical state variation on a recorded image that is obtained by image-capturing of a displayed image,

said displayed image being an image according to the modulated image signal of said direct view type display apparatus,

said optical state variation being independent of an original display image and generating no hampering effect when said displayed image is directly watched, and

a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

22. (Currently Amended) Apparatus for displaying an image, comprising:
a display unit, and
a modulation unit generating temporal modulation in an original image to be displayed on said display unit, wherein

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said luminance modulation causes an optical state variation perceivable by a human vision on a recorded image obtained by image-capturing of the modulated original display image, and

said optical state variation causes no substantial visible effect perceivable by the human vision when said modulated original display image is directly watched, and
a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.

23. (Currently Amended) Apparatus for displaying an image, comprising:
means for displaying an image[[,]]; and
means for generating temporal modulation in an original image to be displayed,
wherein

said luminance modulation causes an optical state variation perceivable by a human vision on a recorded image obtained by image-capturing of the modulated original display image, and

said optical state variation causes no substantial visible effect perceivable by the human vision when said modulated original display image is directly watched, and
a rotation filter, including a rotate-able filter part having a sinusoidal density variation along its circumferential direction, used in said luminance modulation.